DOCUMENT RESUME

SE 005 879

ED 025 432

By- Casey, Ralph; And Others
Central Iowa Low Achiever Mathematics Project - Math in Sports.
Central Iowa Low-Achiever Mathematics Project, Des Moines.
Spons Agency- Office of Education (DHEW), Washington, D.C. Bureau of Elementary and Secondary Education.
Pub Date [Nov 68]
Grant- OEG-3965
Note- 67p.
EDRS Price MF-$0.50 HC-$3.45
Descriptors- Arithmetic, Grade 7, Grade 8, Grade 9, *Instructional Materials, *Low Achievers, *Mathematics, Resource Materials, *Secondary School Mathematics
Identifiers- Central Iowa Low-Achiever Mathematics Project

These materials are designed especially for the low achieving student in mathematics. The booklet contains numerous sports-related exercises which have been prepared as examples of supplementary worksheets. The exercises are designed to take advantage of the student's interest in sports. Materials for this booklet, including the worksheets which are provided, draw on such sports as baseball, basketball, bowling, football, golf, tennis, and track. Mathematical skills emphasized are computational skills, decimals and percent, estimation and rounding off, and averaging numbers. This work was prepared under ESEA Title III contract. (RP)

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

CILAMP

Central Iowa Low Achiever Mathematics Project

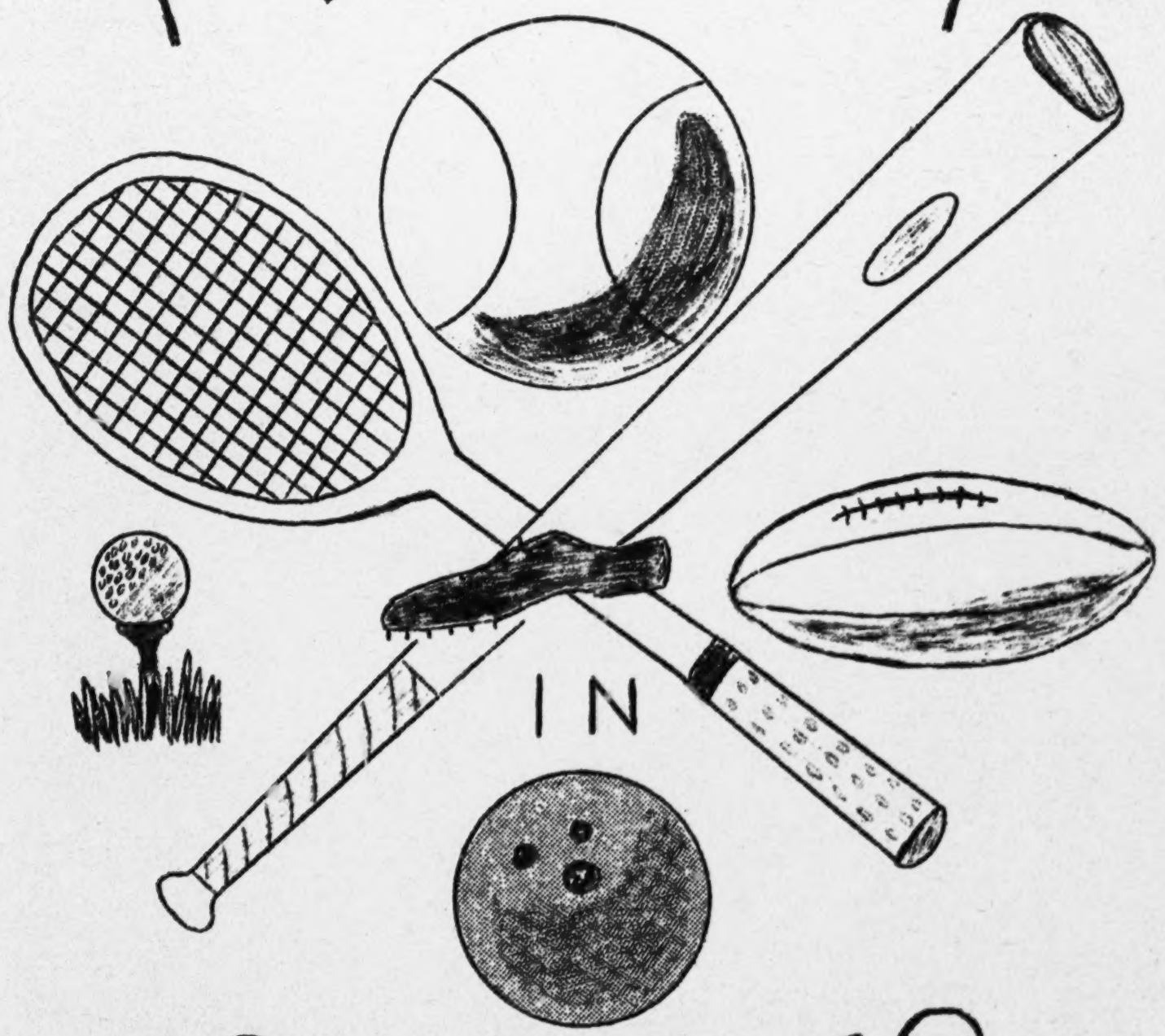
ED025432

The work presented or reported herein was performed pursuant to a Grant, OE No. 3965, from the U.S. Office of Education, Department of Health, Education, and Welfare. However, the opinions expressed herein do not necessarily reflect the position or policy of the U.S. Office of Education, and no official endorsement by the U.S. Office of Education should be inferred.

SE 005 879

1164 26th Street
Des Moines, Iowa 50311

MATH



IN SPORTS

CENTRAL IOWA LOW-ACHIEVER MATHEMATICS PROJECT
(CILAMP)
1164 - 26th Street
Des Moines, Iowa 50311

TABLE OF CONTENTS

MATH IN SPORTS

INTRODUCTION

TOPIC REFERENCE CHART

BASEBALL

BASKETBALL

BOWLING

FOOTBALL

GOLF

TENNIS

TRACK

ANSWER KEY

INTRODUCTION

MATH IN SPORTS was developed by the following 1968-69 CILAMP participants: Ralph Casey, Richard Craven, Paul Linn, Mary Renaud, Evalena Stravers, and Abe Willems.

This booklet contains numerous exercises prepared as examples of supplementary worksheets. The exercises are designed to take advantage of the students' interest in sports. By coupling the format of the material with current information, a variety of activities can be provided for the student. Experience indicates that outdated material has no more student appeal than traditional textbook material.

Students' interest in sports can be used for motivation if the worksheets are used while the particular sport is of current interest. For example, the track and field section could be used during the Olympics, the baseball section during the World Series, etc.

Clip current articles from the newspaper and derive questions (or use those provided in the booklet) for use with the clipping. Using the baseball section as an example, the teacher might clip only the team won and lost columns from the paper and ask the students to complete the table.

Variations could be made by creating situations such as the following:

Using today's standings...
If tomorrow...Detroit loses two games to New York,
the Twins win one from the Angels,
Baltimore beats Cleveland in one game,
Chicago loses one game to the Athletics,
and Boston splits a double header with
Washington....
Make a table giving games played, games won and lost, percentages and standings.

The same idea could be used for pitchers' E.R.A. (earned run averages) or batters' averages.

Quick and easy worksheets can be made from a clipping fastened to a sheet containing questions or tables about the article. This can be made into a transparency for an overhead projector or a spirit master for individual worksheets by a thermofax copier.

Many of the problems, although they are not included in all of the sections, are applicable to many of the other sports.

TOPIC REFERENCE CHART

MATHEMATICAL TOPICS	BASEBALL	BASKETBALL	BOWLING	FOOTBALL	GOLF	TENNIS	TRACK
Computational skills (+,-,÷,×)	1,2,3,4,5,6, 7,8,9,10,11	2,5,6,7,8,9, 10,11,12	1,2,3,4,5	3,4	1,2,3,4,6	3	1
Counting techniques				4			
Decimals or per cent	1,2,3,4,6,7, 8,9,10	5,6,7,8,9,10, 11	5	3,4	2,3,6		1
Estimation and rounding off	1,2,3,4,5,6, 7,8,9,10,11	2,5,6,7,8,9, 10,11	5	3,4			2
Flow charting						3,4	
Metric system							2
Scale drawing and measurement	11	3	5	2,3	5,6	1	1
Geometry (area, perimeter, etc.)	6,11,12	3,12	5	2,3,4	6		
Average	4,5,6,7,8,9, 10,12	4,5,6,7,8		3,4	2,3,4,6		1,2

B
A
S
E
B
A
L
L

This section uses information and situations from baseball to introduce, supplement or review work on per cent and decimals, conversion of distance from one measuring unit to another, and scale drawings.

The exercises are intended to be worksheets which may easily be updated, by use of newspaper accounts, to channel students' enthusiasm for the sport into the classroom. A good example of an opportune time to use this would be during the World Series. The students could be asked to record statistics as they listened to the ball game in class. Examples of problems of this type might be to compute "instant" batting averages; find the per cent of doubles out of the number of hits or times at bat; find the average number of batters for each inning; or any other exercise that strikes the teacher's (or the students') fancy.

BASEBALL STANDINGS

Baseball standings are often called "percentages" but are written as decimals given in thousandths. A team's percentage is determined by dividing the number of games won by the number of games played. The work below shows how to find the percentage of a team which won 44 of 70 games.

$\frac{44}{70}$

$$
\begin{array}{r}
.6285 \\
70\overline{)\,44.0000} \\
\underline{42\;0} \\
2\;00 \\
\underline{1\;40} \\
600 \\
\underline{560} \\
400 \\
\underline{350}
\end{array}
$$

(round to the nearest thousandth)

.629

Find the percentage for each of the American League teams below. Remember to round off your answer to the nearest thousandth.

LEAGUE STANDINGS

Team	Won	Lost	Percentage
Detroit	61	21	
Cleveland	56	24	
Chicago	44	36	
Minnesota	39	39	
New York	38	40	
Baltimore	37	40	
Washington	36	43	
Oakland	34	44	
Boston	30	48	
California	20	60	

Arrange these Connie Mack Baseball Teams according to standing. In the blanks below, put the team with the highest standing first.

TEAM	WON	LOST	PER CENT
Tigers	18	14	
Hawks	19	13	
Wild Cats	12	20	
Cougars	17	12	
Lions	16	16	
Bears	15	17	

TEAM	PER CENT

AMERICAN LEAGUE STANDINGS

TEAM	WON	LOST	PERCENTAGE
Detroit	44	26	.629
Cleveland	38	33	
Baltimore	34	32	
Minnesota	35	33	
Oakland	34	33	
Boston	33	33	
California	33	34	
New York	31	36	
Chicago	30	37	
Washington	25	40	

NATIONAL LEAGUE STANDINGS

TEAM	WON	LOST	PERCENTAGE
St. Louis	44	26	.629
San Francisco	38	33	
Atlanta	36	33	
Philadelphia	32	31	
Los Angeles	36	36	
New York	33	34	
Cincinnati	33	35	
Pittsburgh	31	35	
Chicago	31	37	
Houston	27	41	

Batting averages are figured like team standings. A batter who has 3 hits in 8 times at bat has a batting average of .375.

$$\frac{\text{hits}}{\text{at bat}} = \text{batting average}$$

Find these batting averages:

Times at bat	hits	batting average
20	9	
109	48	
152	38	
12	2	
50	16	
31	11	

A National League player has a batting average of .400. He averages _____ hits out of 5 times at bat.

An American League player has a batting average of .350. He averages _____ hits out of 30 times at bat.

A player has a batting average of .500. He averages _____ out of 62 times at bat.

A player has a batting average of 1.000. He averages _____ hits out of 3 times at bat.

Leading batters in a Des Moines boys' league:

PLAYER AND TEAM	GAMES PLAYED	NUMBER OF HITS
Bob (Eagles)	18	29
Eddie (Warriors)	20	31
Charles (Tigers)	20	40
Don (Wildcats)	16	38
Tom (Bears)	20	49
Mike (Beavers)	15	28
Fred (Cougars)	14	47
George (Beavers)	18	32
Larry (Wildcats)	18	33
Will (Hawks)	20	43

Answer the following questions true or false:

_____ 1. Each boy played the same number of games.

_____ 2. Fred played fewer games than any other boy.

_____ 3. The most games played by any boy was 20.

_____ 4. George, Larry and Bob each played the same number of games

_____ 5. Charles averaged two hits per game.

_____ 6. Don played fewer games than any other boy except Fred and Mike.

_____ 7. Will made at least 2 more hits than did any other boy.

_____ 8. Two teams in the league had two batters listed.

_____ 9. Tom averaged more than 2 hits per game.

_____10. Fred was the only player who averages more than 3 hits per game.

Name _____

The Astrodome, which is located in Houston, Texas, is the home of the Houston Astros baseball team. It is often referred to as the "8th Wonder of the World."

1. a) The annual average attendance at the Astrodome is the same as the sum of the average annual attendance at these places:

Paris' Eiffel Tower	1,750,000
New York's Empire State Building	1,500,000
Washington's Smithsonian Institute	1,250,000

What is the attendance at the Astrodome? _____

b) How many more people come to the Astrodome than the Los Angeles Dodgers' Stadium if the attendance at the Dodgers' is 3,250,000? _____

2. The Astrodome has 45,000 seats for baseball and 52,000 seats for football.

a) If each seat for baseball sold for $2.50, how much money would be taken in if all the seats were filled for a certain baseball game? _____

b) If each seat for football sold for $2.00, how much money would be taken in if all the seats were filled for a certain football game? _____

c) How much more money can be taken in at the baseball game than the football game? _____

3. If the area playing field of the Rome Colosseum is about 42,000 sq. ft., and that of the Astrodome is about 125,000 sq. ft., how many times larger is the Astrodome playing field as compared to the Rome Colosseum? _____

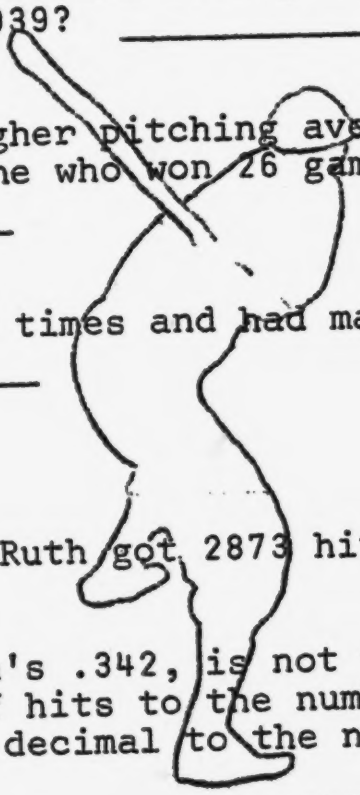
4. To reduce the acoustical problem in the Astrodome, the underside of each of the stadium's seats was perforated with 1,078 holes. How many perforated holes are there in 45,000 seats? _____

5. With the Astrodome stadium being in use about 15 days per month, the electrical bill will run to more than $30,000 per month. What would be the average electrical bill for the stadium for being used two days? _____

1. Pitching and batting averages are expressed as three place decimals. During Bob Feller's best pitching season, in 1939, he was credited with winning 24 games and charged with losing 9 games. What was Feller's pitching average for 1939? _____

2. Which pitcher would have the higher pitching average--one who won 21 games and lost 10 games or one who won 26 games and lost 13 games? _____

3. Joe DiMaggio had been at bat 26 times and had made 10 hits. What was his batting average? _____



4. Out of 8396 times at bat, Babe Ruth got 2873 hits for a lifetime batting average of .342.

   A batting average, such as Ruth's .342, is not truly a per cent but is a ratio of the number of hits to the number of times at bat (i.e. $\frac{2873}{8396}$) expressed as a decimal to the nearest thousandth.

   If Babe Ruth's lifetime batting average of .342 were actually given as a per cent, how would it be written? _____

5. If Richie Allen of Philadelphia had 17 hits out of 49 times at bat, what is his average? _____

6. Willie Mays had made 49 hits in 147 times at bat. Find his average. _____

7. In 1967, Roberto Clemente of the Pittsburgh Pirates led the National League for hitting. He hit safely 209 times out of 585 times at bat. What was his batting average for that season?

   _____

8. The last time that Mickey Mantle of the New York Yankees, won a batting title in the American League was in 1956. His average was .353. If he had 533 official times at bat, how many hits did he get? _____

9. A few years ago, before Gil Hodges became manager of the Washington Senators and later the New York Mets, he ended the season with a batting average of .304. Express this as a per cent. _____

10. One player has made 16 single-base hits. These hits are .8 of all his hits. How many hits in all has this player? _____

16 = .8 of all his hits

$$\frac{.8}{1} = \frac{16}{X}$$

11. Ted Williams is the last player in either major league to end the season with a batting average of over .400. In 1941, he had 185 hits out of 456 "at bats." What was his batting average? _____

12. If Orlando Cepeda hits safely 4 out of 8 times at bat, what is his average? _____

PLAYER	GAMES	WON	LOST	PERCENTAGE
Don Drysdale (Dodgers)	38	13	16	
Joel Horlen (White Sox)	35	19	7	
Luis Tiant (Indians)	33	12	9	
Ferguson Jenkins (Cubs)	38	20	13	

A pitcher's per cent (PCT) is the ratio, expressed as a decimal, of the number of games he won compared to the total number of games he won and lost. During the 1967 season, Luis Tiant pitched in 33 games. He received credit for winning 12 games and was charged with losing 9 games. He pitched in how many games which did not count for or against him? _____

Find the pitching percentage expressed as a decimal to the nearest thousandth for the four pitchers in the above table:

Tiant $\quad \frac{W}{W + L} = \frac{12}{12 + 9} =$

What was the average pitching percentage for the four pitchers listed in the table above? _____

Which pitcher had the best record in terms of percentage of games won? _____

This table shows the final team standings for the National League in 1967.

TEAM	GAMES WON	GAMES LOST	PCT.
St. Louis	101	60	
San Francisco	91	71	
Chicago	87	74	
Cincinnati	87	75	
Philadelphia	82	80	
Pittsburgh	81	81	
Atlanta	77	85	
Los Angeles	73	89	.451
Houston	69	93	
New York	61	101	

A team standing is found by dividing the number of games won by the number of games played. For example:

$$\text{Los Angeles-}\ \frac{\text{Games won}}{\text{Games played}} = \frac{73}{162} = .451$$

Fill in the missing averages in the table above.

Compare the standings from 1967 with this year's standings.

Which teams are higher in the standings now than they were in 1967?

Which teams rank lower now than in 1967?

Which teams are in the same position as they were in 1967?

SUGGESTED ACTIVITIES:

1. Have several copies of the morning paper delivered to your school. Each day, follow the baseball standings recorded on the sports page.

2. Have students bring clippings from the sports page. Record changes in standings or percentages. Post on bulletin board.

3. Take a vote on the favorite sports in your class. Make a table showing the results. Make a bar graph from this table.

4. Make a scale drawing of a baseball field. (Use 1" = 10 ft.)

   What is the distance between bases? actual _____ scale _____

   What is the distance between home plate and second base? actual _____ scale ≈_____

   What is the distance between first base and third base? actual _____ scale ≈_____

   What is the distance from the pitching rubber to home plate? actual _____ scale _____

5. Bring a radio to class during the World Series. Allow the students to listen to the game while they work on a math assignment related to the game.

HOMERUN DISTANCES
IN THE MAJOR LEAGUE BASEBALL PARKS

TEAM	NAME OF PARK	Feet From Home Plate To Fence: left field	center field	right field
Atlanta (NL)	Atlanta Stadium	330	402	330
Baltimore (AL)	Memorial Stadium	309	410	309
Boston (AL)	Fenway Park	315	420	302
California (AL)	Anaheim Stadium	333	406	333
Chicago (AL)	White Sox Park	352	415	352
Chicago (NL)	Wrigley Field	355	400	353
Cincinnati (NL)	Crosley Field	328	387	366
Cleveland (AL)	Municipal Stadium	320	408	320
Detroit (AL)	Tiger Stadium	340	440	325
Houston (NL)	Astrodome	340	406	340
Los Angeles (NL)	Dodger Stadium	330	410	330
Minnesota (AL)	Metropolitan Stadium	346	425	330
New York (AL)	Yankee Stadium	301	461	296
New York (NL)	Shea Stadium	341	410	341
Oakland (AL)	Oakland-Alameda County Stadium	330	410	330
Philadelphia (NL)	Connie Mack Stadium	334	447	329
Pittsburgh (NL)	Forbes Field	365	457	300
San Francisco (NL)	Candlestick Park	335	410	335
St. Louis (NL)	Busch Memorial Stadium	330	414	330
Washington (AL)	D. C. Stadium	335	410	335

- -

1. In which baseball park (s) is the right field fence farther from home plate than the left field fence?

2. Which parks are symmetrical? (Have the right and left field fences the same distance from home plate.)

3. In which park does a home run hit over the center field fence travel the least distance? the greatest distance?

4. What is the average distance from home plate to each of the fences for the National League teams? for the American League teams? for all twenty teams?

5. If you ran from home plate along the left field foul line to the left field fence, then ran across the outfield to the point where the right field fence meets the right field foul line, and finally continued your trip by running to home plate along the right field foul line, HOW FAR WOULD YOU HAVE TRAVELED IN EACH OF THE FOLLOWING PARKS (to the nearest foot)?

   a) Yankee Stadium
   b) Metropolitan Stadium
   c) White Sox Park
   d) Busch Memorial Stadium
   e) Shea Stadium

B A S K E T B A L L

Most of the activities in this section are based on the statistics compiled by high school basketball teams. The statistics of your local team could easily be used to replace the data given here. Note that most of the problems could be used with either the statistics recorded for one game or for a season.

This section also includes work on measurement, conversion, volume, area, a good deal of per cent, and work with units of time.

BASKETBALL

Basketball is said to be the most all-American sport.

Dr. James Naismith is given credit for inventing the game in 1871.

Two peach baskets were put up on opposite ends of a gym. Naismith threw in a soccer ball to play with--and basketball was born.

Maximum dimensions for a basketball floor are 94 x 50 feet.

Minimum dimensions are 74 x 42 feet.

An official basketball is about 30" in circumference and weighs 20 to 22 ounces.

The baskets are 10 feet above the floor.

The metal baskets are 18" in diameter.

Two points are scored for a field goal. (f.g.)

One point is scored for a free throw. (f.t.)

Both boys and girls high school games are played in 4 eight minute quarters. College games are played in 2 twenty minute halves, and professional basketball is played in 4 twelve minute quarters.

Intermission between quarters (high school) is one minute and ten minutes between halves.

The boys' game requires 5 players and a girls' game requires 6 players.

WHAT DO YOU THINK? (Choose the best possible answer.)

1. Basketball was invented: a) more than 100 years ago, b) less than 100 years ago, c) exactly 100 years ago. _____

2. The baskets are a) less than 3 yards above the floor, b) more than 3 yards but less than four yards above the floor, c) more than four yards above the floor. _____

3. A doorway should be a) 85" high, b) 82" high, c) 88" high if "Wilt the Stilt" Chamberlain could walk through it without stooping or bumping his head. (Wilt Chamberlain is 7' 1" tall.) _____

4. A basketball weighs about a) 1 1/4 pounds, b) 1 3/4 pounds, c) 1 pound. _____

5. The area of a maximum sized basketball floor is a) 4700 feet, b) 4700 square yards, c) 4700 square feet. _____

6. The area of the minimum sized basketball floor is a) 3108 square feet, b) 3008 square feet, c) 3208 square feet. _____

7. In order to run a mile you would have to run a) 18 laps, b) 22 laps, c) 19 laps around the maximum sized floor. _____

8. You would have to run a) 23 laps, b) 22 laps, c) 24 laps around the minimum sized floor in order to run a mile. _____

9. If there were no "time-out" periods other than the breaks at the end of the quarters and the half, how long would a basketball game last? a) 50 minutes, b) 38 minutes, c) 44 minutes. _____

10. How many minutes of actual playing time in a junior high basketball game? a) 16 minutes, b) 32 minutes, c) 64 minutes. _____

Note: Let students choose answers individually, then let them form a group and make group decisions. Compare results.

SUGGESTED ACTIVITIES

1. Make a scale drawing of a maximum sized basketball floor. A minimum sized floor. Use the scale 1" = 16 ft.

2. Measure your basketball floor. Find the area in square feet. Square yards. Find the perimeter of your floor. How many laps would you have to run around it in order to run a mile?

3. Measure the height of your classroom door. Could "Wilt the Stilt" Chamberlain walk through it without stooping or bumping his head?

4. Measure the length of your bed. Could Wilt Chamberlain sleep in it stretched out full length?

5. Wilt Chamberlain scored 100 points in one game. Follow your favorite college or professional team and see if anyone ties or breaks his record this season.

6. Do some research about your favorite players, past or present, to find some of their unusual feats.

SUMMARY SHEET

Seasons' Statistics L-S 1966-67 21 wins 5 losses	letter winners	games played	f.g. attempted	f.g. made	f.g. per cent	f.t. attempted	f.t. made	f.t. per cent	total points	Average	Rebounds	Bad passes	Violations	Interceptions	Assists	Jump balls	Fouls
Carol	★	26	613	261		235	175				45	42	25	9	116	56	22
Judy	★	26	357	144		40	30				65	23	27	27	139	35	20
Vicki	★	26	383	169		151	99				81	33	40	15	144	57	31
Margaret	★	19	42	13		13	7				15	9	4	2	15	13	13
Connie		14	28	4		12	5				8	3	1	1	0	2	2
Ilene		6				2					3	1	0	0	0	1	0
Joan	★	21				1					19	12	4	9	2	8	33
Jane	★	26									142	25	9	33	0	40	67
Linda	★	26									122	15	12	67	0	49	41
Mary	★	26									139	29	20	82	0	56	46
Barbara		11									10	2	3	4	0	3	5
Carolyn V.		15									11	2	2	3	0	3	7
Carolyn T.		12									10	2	0	1	0	11	4
L-S Total																	
Opponent Total			1,045	388	37.1	516	322	62.4	1108	42.6	636	355	217	126	312	344	373

Use with pages which follow.

The summary sheet given to the girls by their coach at the end of the season was not completed. The girls found they had the following computations yet to make:

1. Per cent of f.g. made. (To tenths of per cent)

2. Per cent of f.t. made. (To tenths of per cent)

3. Total points.

4. Average points per game for each forward. (Carry to tenths)

5. Friendships totals that corresponded to their opponents total.

The girls were soon busily trying to find the correct answers with which to fill the blanks. Carol, finishing first, checked with the coach to see if he agreed with her work. She was told that she had computed correctly but that there were other ways also. Here are Carol's solutions:

To find per cent of field goals made (f.g.) Carol thought:

> Attempted field goals--613. Field goals made--261. I can compare the two by writing the fraction $\frac{261}{613}$.

I know that $\frac{261}{613}$ means 261 ÷ 613.

I must multiply by 100 for per cent. This is my equation:

$$\frac{261}{613} \times \frac{100}{1} = n$$

```
        42.57= 42.6%
613/ 26100.00
     2452
      1580
      1226
       3540
       3065
        4750
        4291
         459
```

She followed the same idea for free throws. (f.t.)

$$\frac{175}{235} \times \frac{100}{1} = n$$

```
        74.46= 74.5%
235/ 17500.00
     1645
      1050
       940
       1100
        940
        1600
        1410
         190
```

To find total points, think:

$$\begin{aligned} (2 \times \text{f.g.}) + \text{f.t.} &= n \\ (2 \times 261) + 175 &= n \\ 522 + 175 &= n \\ 697 &= n \end{aligned}$$

To find average, think:

26 games played
697 total points

$$\frac{697}{26} = n$$

$$\begin{array}{r} 26.80 = 26.8 \\ 26 \overline{)\,697.00} \\ \underline{52} \\ 177 \\ \underline{156} \\ 210 \\ \underline{208} \\ 20 \end{array}$$

Now do the computations for Judy, Vicki, Margaret, and Connie. Fill in the blanks on the summary sheet. (You do not have to use Carol's idea of finding per cent if you have a way you understand better.)

Show your work below.

Judy:

Vicki:

Margaret:

Connie:

Now total the columns, so as to compare L-S's totals with those of their opponents.

Why didn't the girls total the column headed "games played?"

_____

_____

_____

_____

Which girl made the greatest per cent of her free throws? _____

Which girl made the greatest per cent of her field goals? _____

The girls then wanted to know what per cent of the field goals and free throws they had missed, but Carol said that was just too much long division for her. After a few moments of silence, Judy spoke up. "If we had made all the baskets we attempted, we would have made 100% of them. So, all we will have to do is subtract the per cent of each that we made from 100% and we will know the per cent missed. Like this. See."

$$\begin{array}{r} 100.0\% \\ -40.3\% \\ \hline 59.7\% \end{array} \text{ (f.g.)} \qquad \begin{array}{r} 100\% \\ -75\% \\ \hline 25\% \end{array} \text{ (f.t.)}$$

Now find the per cent of field goals and free throws that each of the other girls missed.

	per cent of field goals missed	per cent of free throws missed	Show your work here
Carol	_____	_____	
Vicki	_____	_____	
Margaret	_____	_____	
Connie	_____	_____	

1. During a free throw practice period, Sandy made a basket 17 times out of 25. Three friends helped her to find what per cent of her free throws made baskets. Which of the following methods do you prefer?

DIANE:

$$\frac{17}{25} = \frac{N}{100}$$

$$17 \times 100 = 25 \times N$$

$$\frac{17 \times \cancel{100}^{4}}{\cancel{25}_{1}} = N$$

$$N = 68$$

JOAN:

$$\frac{17}{25} = \frac{N}{100}$$

$$\frac{17}{25} \times \frac{4}{4} = \frac{N}{100}$$

$$\frac{68}{100} = \frac{N}{100}$$

$$N = 68$$

JOYCE:

$$25\overline{)17.00}$$

$$\begin{array}{r} .68 \\ 25\overline{)17.00} \\ \underline{15\ 0} \\ 2\ 00 \\ \underline{2\ 00} \end{array}$$

2. Use each of the three methods to find Diane's percentage. 10 baskets out of 40 shots.

3. Use whichever method you prefer:

a) 16 out of 32 is what per cent?

b) 20 out of 60 is what per cent?

c) 12 is what per cent of 30?

FREE THROW RECORD

	made	missed	tried	per cent	
				made	missed
Sandy	48	72			
Diane	75	50			
Joan	53	53			
Joyce	60	30			
Carol	75	25			

Which girl has the best free throw record? _____

Why is it better to use the per cents rather than the scores to compare the records?

_____

What is the total of the per cents made and the per cents missed for each girl? _____ Why is this so? _____

For each sentence, find the per cent that makes it true.

a) 12 is _____% of 32.

b) 8 is _____% of 12.

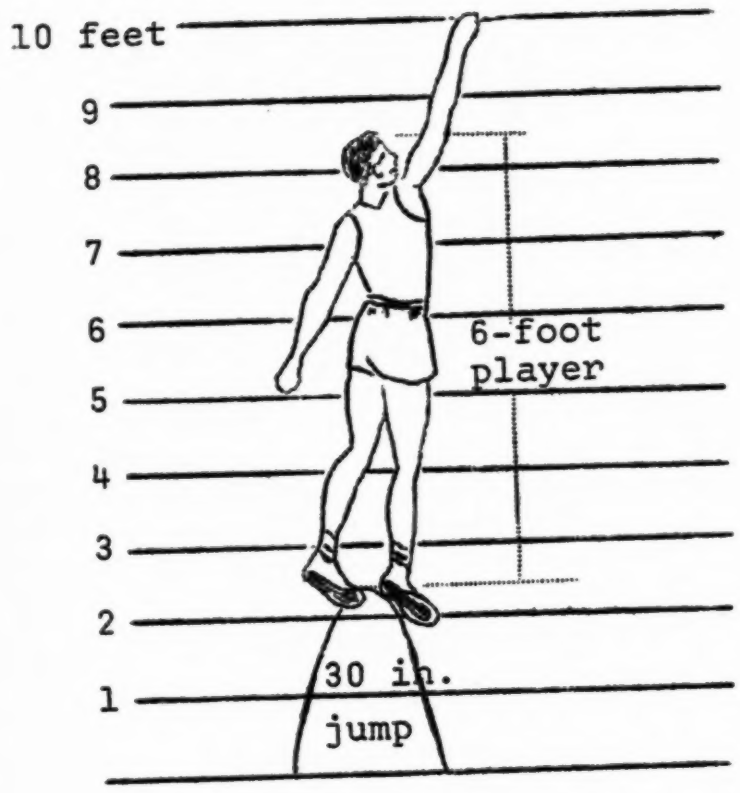
c) 9 is what per cent of 15? _____

d) 225 out of 900 is _____%.

e) 3 = _____% of 5.

f) 7 = _____% of 28.

g) 100 = _____% of 400.



Most people can stretch above their heads for a distance which is about 1/4 of their height. Now, suppose you can jump 30 inches off the floor. To determine how high a player can reach, add 30 inches to the height of the player + 1/4 of the height of the player.

Let X represent the height of the player. Set up the formula. Measure your own height and figure out how high you can reach.

How high can a player reach if his height is:

6 ft. 5 in.

5 ft. 8 in.

6 ft. 2 in.

5 ft. 4 in.

If an athlete can jump 36 inches from the floor, how high could he reach if he were 6 ft. 8 in. tall?

If Wilt Chamberlain can jump 39 inches, how high can he reach? His height is 7 ft. 1 in.

B O W L I N G

The section on bowling provides abundant drill on addition facts and contains problems on per cent, area, perimeter, graphing, average, and scale drawing.

If bowling is a part of the physical education curriculum in your school, this section might be used at a time mutually convenient to the Physical Education instructor and the mathematics teacher.

A. RULES

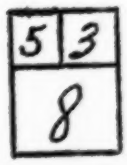
Although scoring looks complicated at first, actually it becomes easy if you remember and follow these simple rules:

1. Each game or "line" on the score sheet consists of 10 frames. Each box on the score sheet represents one frame.

2. The maximum number of balls rolled in each frame is two.

3. If you fail to topple all 10 pins with 2 balls, you simply record the number of pins you knock down on each roll.

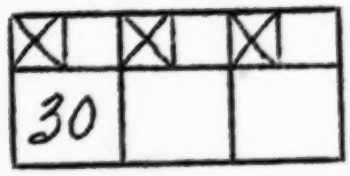
   1st ball--5 pins knocked down
   2nd ball--3 additional pins knocked down



4. If you get a STRIKE (all 10 pins down with the roll of your first ball), you get a score of 10 in that frame plus the number of pins you knock down with your next 2 balls. The maximum score for any frame, therefore, is 30--representing 3 strikes in a row.

   A strike is scored by marking an X as shown below:

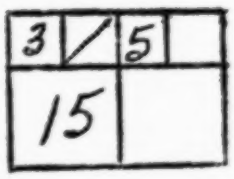
   1st ball--strike
   2nd ball--strike
   3rd ball--strike



5. If you get a SPARE (10 pins knocked down on 2 rolls), you score 10 in that frame, plus the number of pins you knock down with your next ball in the next frame.

   A spare is scored by marking a / as shown below:

   1st ball--3 pins
   2nd ball--remaining 7 pins (spare)
   3rd ball--5 pins



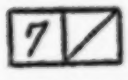
6. A SPLIT results if, on your first roll, you knock down the head pin and leave at least two pins standing while at least one of the pins normally placed between the standing pins is toppled.

   A split is recorded by marking a ◯ in the upper right corner of the frame on the score sheet. If, on your second roll, the remaining pins are toppled, the split is said to be "converted" and results in a spare. (See example for a converted split in "B" below.)

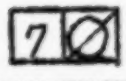
B. SCORING SHORTHAND

You keep score with these figures and symbols in the two small squares of each frame.

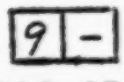
STRIKE



SPARE



CONVERTED SPLIT



MISS OR GUTTER BALL

1	2	3	4	5	6	7	8	9	10	TOTAL
5 | 3	6 | /	6 | /	X	1 | 6	X	X	3 | 3	8 | -	X X X	
8	24	44	61	68	91	107	113	121	151	151

(5+3) (10+6) (10+10) (10+7) (7) (10+10+3) (10+3+3) (6) (8) (20+10)

8 + 16 = 24; 24 + 20 = 44; 44 + 17 = 61; 61 + 7 = 68; 68 + 23 = 91; 91 + 16 = 107; 107 + 6 = 113; 113 + 8 = 121; 121 + 30 = 151

C. SCORING A TYPICAL GAME:

1st Frame: 5 pins fall down on first ball; 3 on second. A score of 8 for this frame.

2nd Frame: 6 pins down on first ball; 4 on next for a SPARE. Do not total the score yet; you still have a bonus to add from the first ball in the next frame. (Spare = 10 points + pins toppled by your next ball.)

3rd Frame: 6 pins on first ball. Now you can total the score for the 2nd Frame: 10 pins for the spare plus 6 for your bonus = 16. Add 16 to the 8 from the 1st Frame for a score of 24.
Second ball; you knock down all 4 remaining pins for another SPARE. Do not total the score for the 3rd Frame yet.

4th Frame: A STRIKE. Mark an X in the first small square of the 4th Frame and figure the score for Frame 3: 10 for spare + 10 for score on first ball in next frame = 20. Add 20 to the score of 24 = 44 for 3rd Frame.

5th Frame: 1 pin knocked down on first ball; 6 on second; 7 is then your bonus and you get 10 for the strike = 17 for the frame, a total of 61 for the 4th frame. Now add the 7 pins you got in the 5th frame for a total of 68 for the 5th Frame.

6th Frame: A STRIKE. Mark an X in first small square of 6th Frame, but do not total the score for the 6th Frame yet.

7th Frame: Another STRIKE. Mark an X in the 7th Frame. Do not total the score for frames 6 or 7 yet.

8th Frame: 3 pins knocked down with first ball. Now you can complete score for 6th Frame: 10 for strike in 6th Frame + 10 and 3 for the scores of your next two balls = 23 in 6th Frame for total of 91.
3 pins down with the second ball. Now complete the score for 7th Frame: 10 for a strike + 6 for a bonus = 16 plus previous score of 91 = 107 for 7th Frame. Now, add 6 pins for the 2 balls in 8th Frame for a total of 113 in the 8th Frame.

9th Frame: 8 pins down on first ball; none on second, a MISS. 113 + 8 = 121 for 9th Frame.

10th Frame: STRIKE. Make an X. On the 10th Frame don't wait for your next turn to take your bonus rolls. You have a strike, so roll two extra balls. Strike on first bonus ball. Strike on second bonus ball. Now finish the score: 10 for strike in the 10th Frame + 10 for first bonus ball + 10 for second bonus ball = 30. Add 121 to 30. Total score for game = 151.

1. Fold this paper in half.
2. Score the top five games, then check your answers on the bottom of the sheet.

	NAME	1	2	3	4	5	6	7	8	9	10	TOTAL
1	Jim	4 3	7 2	- 6	1 8	7 /	8 1	X	4 5	4 /	3 5	
2	Jean	6 3	4 /	7 /	2 6	X	7 2	- /	X	3 5	4 / 7	
3	Frank	X	9 -	5 /	4 5	X	X	X	X	6 /	7 -	
4	Paul	X	X	4 /	4 5	X	X	X	X	4 3	7 / X	
5	Your Name	7 /	X	X	4 5	X	X	3 /	X	X	X 7 /	

	NAME	1	2	3	4	5	6	7	8	9	10	TOTAL
1	Jim	4 3	7 2	- 6	1 8	7 /	8 1	X	4 5	4 /	3 5	
		7	16	22	31	*(10+8) 49	58	(10+4+5) 77	86	(10+3) 99	107	107
2	Jean	6 3	4 /	7 /	2 6	X	7 2	- /	X	3 5	4 / 7	
		9	(10+1) 26	(10+2) 38	46	(10+7+2) 65	74	(10+10) 94	(10+5+5) 112	120	(10+7) 137	137
3	Frank	X	9 -	5 /	4 5	X	X	X	X	6 /	7 -	
		(10+9) 19	28	(10+4) 42	51	(10+10+10) 81	(10+10+10) 111	(10+10+6) 137	(10+10) 157	(10+7) 174	181	181
4	Paul	X	X	4 /	4 5	X	X	X	X	4 3	7 / X	
		(10+10+4) 24	(10+10) 44	(10+4) 58	67	(10+10+10) 97	(10+10+10) 127	(10+10+4) 151	(10+4+3) 168	175	(10+10) 195	195
5	Your Name	7 /	X	X	4 5	X	X	3 /	X	X	X 7 /	
		(10+10) 20	(10+10+4) 44	(10+4+5) 63	72	(10+10+3) 95	(10+10) 115	(10+10) 135	(10+10+10) 165	(10+10+7) 192	(10+10) 212	212

*Note: The numbers in parentheses have been included to help explain the scoring.

From the information given below, determine the scores for Tom, Nancy, Chuck and Karen. Put your name in the last line and determine your score.

	NAME	1	2	3	4	5	6	7	8	9	10	TOTAL
11	Tom	X	X	4 /	- 8	8 1	4 -	2 5	X	3 /	8 1	
12	Nancy	4 5	6 ①	1 7	9 -	- -	4 4	1 8	9 -	3 /	4 3	
13	Chuck	8 /	X	4 2	X	6 3	4 /	3 3	8 1	9 ⊖	- /	4
14	Karen	9 /	X	X	4 /	3 4	8 -	9 /	8 1	X	4 2	
15	Your Name	X	X	X	4 /	8 1	X	X	X	5 2	7 ∅	X

Make your own score. Have a partner check it.

16												
17												
18												
19												
20												

1. In 1958 there were 6,870 bowling establishments. By 1968 there were 8,860 bowling establishments. How many more bowling establishments were there in 1968 than 1958?

2. (Refer to question 1.) What is the per cent of increase?

3. The owner purchased 85 bowling balls. The average weight of each ball is 16 pounds. Find the total weight.

4. How long has the American Bowling Congress been in existence since it was organized in 1895?

5. Find the radius of a bowling ball that is 27 inches in circumference.

6. (Refer to question 5.) Find the surface area.

7. (Refer to question 5.) The distance from the foul line to the first pin is 60 feet. Approximately how many turns or revolutions will the bowling ball make from the foul line to the head pin?

8. The distance from the beginning of the lane to the foul line (the approach), is approximately 15 feet and from the foul line to the pit is 63 feet. What is the total distance?

9. (Refer to question 8.) If the width of a lane is 3.5 feet, find the total area of the lane.

10. (Refer to questions 8 and 9.) Find the perimeter of the lane.

11. What per cent of the total area is the area of the approach?

12. Make a line graph to show the five scores of Jim, Jean, Frank, Paul, and yourself.

13. Make a scale drawing of one bowling lane.

14. What will be the total cost for the game you bowled with Jim, Jean, Frank and Paul if each line bowled costs 51¢?

15. Assume none of you brought your own bowling shoes so you must all pay rent on 5 pairs of bowling shoes at 15¢ each. Three of the bowlers have their own bowling balls so two of the bowlers must use the bowling establishment's balls, but they do not charge you rent for use of the balls. What is the total cost for all five bowlers for equipment and game? (Refer to question 14.)

16. Collect pictures of score cards and bowling for the bulletin boards.

F O O T B A L L

The section on football emphasizes work with scale drawing and diagraming, per cent, averages, and counting techniques. The starred problems are research problems which are optional. The exercise which uses the local team's records can be used on any convenient form such as the form the local coaches use. Some students could collect this (and more) information for use during the class following the game.

Many of the types of problems used on the section on baseball can be adapted for use in this football section. Students could look up current information on their favorite team or player for use by the class. By doing this, the student will become more involved in the work of the class.

FOOTBALL FACTS

THE FIELD - 100 yards in length, 53 1/3 yards wide
the end zones are 10 yards deep behind the goal line
the goal posts must not exceed 20 feet in height and are 24 feet apart
the horizontal crossbar is 10 feet above the ground

THE BALL - a prolate spheroid (whew!)

circumference	not less than 28 inches
	not more than 28 1/2 inches
the long axis	not less than 21 1/4 inches
	not more than 21 1/2 inches
the short axis	not less than 11 inches
	not more than 11 1/4 inches
the weight	not less than 14 ounces
	not more than 15 ounces
the air pressure	not less than 12 1/2 pounds
	not more than 13 1/2 pounds

TIME OF GAME - Four periods of 15 minutes each

THE CONVERSION LINE - (the line from which the point after a touchdown is attempted)

High School	2 yard line
College	3 yard line
Professional	2 yard line

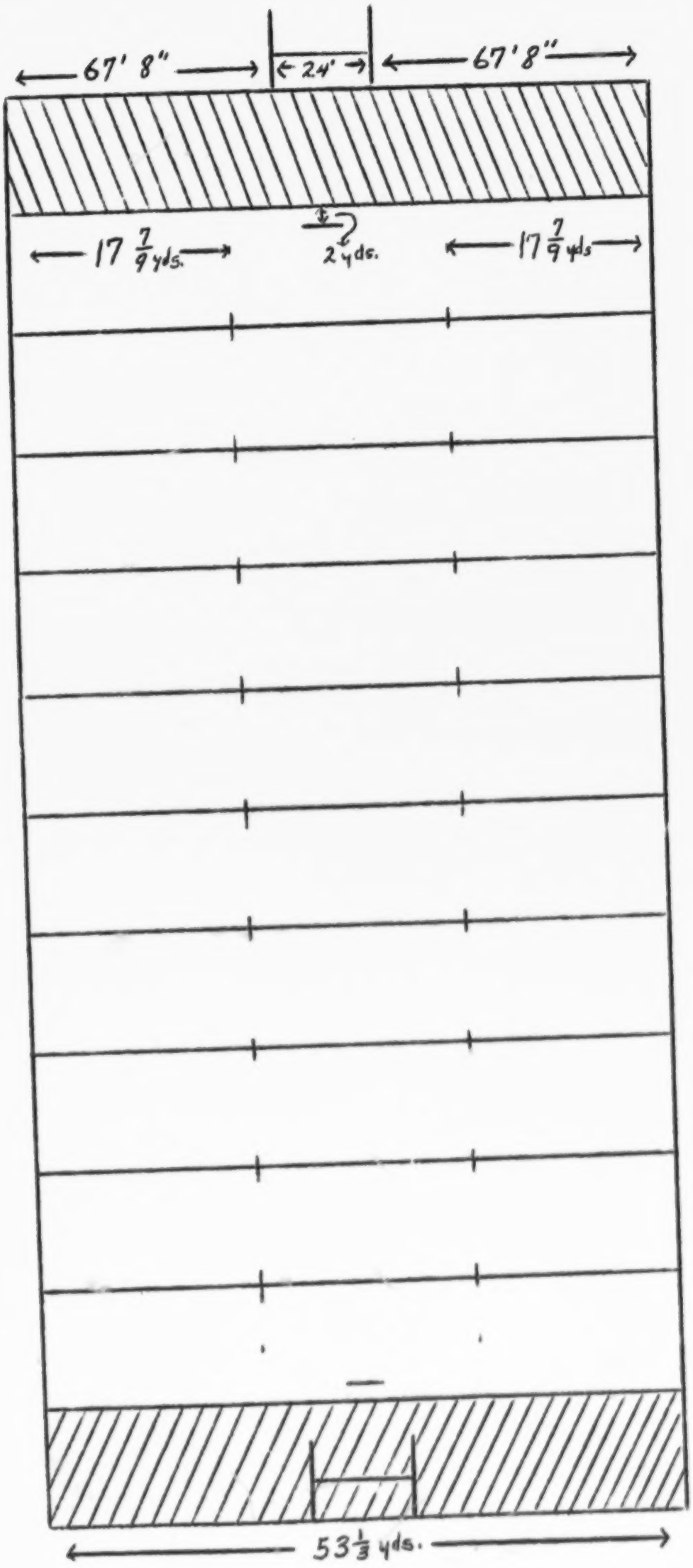
P.A.T. SCORES -

High School	1 point (kick or run)
College	1 point (kick) 2 points (run)
Professional	1 point (kick or run)

SCORING (HIGH SCHOOL) -

Touchdown	6 points
Safety	2 points
Field Goal	3 points
Point after touchdown	1 point

Reference - The Encyclopedia of Sports, Third Revised Edition, Menke, Frank G., A. S., Barnes and Co., New York.


67' 8"
24'
67' 8"
17 7/9 yds.
2 yds.
17 7/9 yds.
53 1/3 yds.

1. Estimate from the drawing:

   How many feet does each inch on the drawing represent? _____
   How many yards? _____
   *How would the drawing be changed if the field were to be used
   for a professional game?
   for a college game?

2. In a high school game, the ball is on the defensive team's 12 yard line midway between the sidelines. The place kicker stands four feet behind the spot from which the ball will be kicked. The ball is placed to be kicked 12 yards behind the line of scrimmage. (Draw a diagram of this situation to help you answer the following questions.)

   a) How far must the ball be kicked to score a field goal? _____yds.
      How many feet? _____ft.
   *b) About how far must the ball be kicked if the ball is not in the center of the field but is on the right hash mark? _____
   (hash marks are located 17 7/9 yards in from both side lines)
   c) Find the answers to the two previous questions if this were a professional game.

3. Obtain a game or season record from the coach of your school team and find--

   a) total yards gained from scrimmage _____
   b) total yards gained from rushing _____
   c) total yards gained for each ball carrier _____
   d) number of punts attempted _____
   e) total yards gained by punting _____
   f) number of P.A.T.'s missed _____
   g) number of P.A.T.'s made _____
   h) number of passes attempted _____
   i) number of passes not completed _____
   j) average yards gained per carry for each ball carrier _____
   k) average yards gained per punt _____
   l) per cent of P.A.T.'s made _____
   m) per cent of passes completed _____

4. A football team begins play on their own 20 yard line. Four plays from scrimmage developed as follows--

   On the first play they gained 7 yards;
   then they gained 2 yards;
   then they lost 3 yards;
   on the fourth play they gained 8 yards.
   What yard line are they on now?

5. A football team starts play on their own 30 yard line. Four plays from scrimmage are described below:

   On the first play they gained 5 yards;
   then they lost 10 yards;
   then they lost 4 yards;
   finally they lost 4 more yards.
   What yard line are they on now?

6. If a quarterback threw 18 passes and completed 10, what was his percentage of completion?

7. If a kicker kicks punts of 44 yards, 39 yards, 46 yards, 28 yards, and 38 yards, what is his average yardage?

8. If a quarterback runs with the ball and gains 9 yards, 2 yards, 6 yards, and 11 yards in four carries, what is his average number of yards gained?

9. What is the smallest volume a football could have? (in cubic inches

10. What is the area of the playing field (not including the end zones)?

*11. In how many ways can a high school team score 18 points in a game?

	Td.	P.A.T.	Field Goal	Safety	Total Points
1)	3	0	0	0	18
2)	0	0	6	0	18

_____ ways to score 18 points.

G
O
L
F

The section on golf provides a great deal of drill on averages, scale drawings, and per cent. A suggestion to supplement the geometry in this section is to ask individuals to make a scale of a local course and have the class answer pertinent questions regarding the course and the records of local golfers.

URSKUL GOLF AND COUNTRY CLUB

Score Card

Hole	Yards	Par
1	447	4
2	340	4
3	297	4
4	210	3
5	363	4
6	510	5
7	481	5
8	328	4
9	175	3
Total		

PAR - The number of strokes, based upon the length of each hole that is set as a player's goal.
BIRDIE - One stroke less than par.
EAGLE - Two strokes less than par.
BOGIE - One stroke more than par.
DOUBLE BOGIE - Two strokes more than par.

Using the information given above, answer the following questions:

1. What is the total length of this course in yards? _____

2. If a player two-putts every green, what is the minimum distance his fairway shots must average on each hole in order for him to par each hole? birdie each hole? bogie each hole?

Hole	Par	Bogie	Birdie
1	_____	_____	_____
2	_____	_____	_____
3	_____	_____	_____
4	_____	_____	_____
5	_____	_____	_____
6	_____	_____	_____
7	_____	_____	_____
8	_____	_____	_____
9	_____	_____	_____

3. If a player parred the course, what would be his total score?

_____

Given below are the leading golf money winners from years 1960 - 1967.

Leading Money Winners

1960	Arnold Palmer	$ 75,263	1964	Jack Nicklaus	$113,284
1961	Gary Player	64,540	1965	Jack Nicklaus	140,752
1962	Arnold Palmer	81,449	1966	Billy Casper	121,944
1963	Arnold Palmer	128,230	1967	Jack Nicklaus	188,998

1. What is the total winnings of these eight players?

2. What is their average winnings?

3. How much below or above the average was each player?

	Above or Below	
Arnold Palmer	_____	_____
Gary Player	_____	_____
Arnold Palmer	_____	_____
Arnold Palmer	_____	_____
Jack Nicklaus	_____	_____
Jack Nicklaus	_____	_____
Billy Casper	_____	_____
Jack Nicklaus	_____	_____

4. If 1/4 of their winnings were paid out in taxes, how much would each pay?

Arnold Palmer	_____
Gary Player	_____
Arnold Palmer	_____
Arnold Palmer	_____
Jack Nicklaus	_____
Jack Nicklaus	_____
Billy Casper	_____
Jack Nicklaus	_____
TOTAL	_____

5. If their expenses (food, travel, etc.) amounted to 1/3 of their winnings, how much would each pay for expenses?

Arnold Palmer	_____
Gary Player	_____
Arnold Palmer	_____
Arnold Palmer	_____
Jack Nicklaus	_____
Jack Nicklaus	_____
Billy Casper	_____
Jack Nicklaus	_____
TOTAL	_____

U.S. OPEN

1960	Arnold Palmer	280	1965	Gary Player	282
1961	Gene Littler	281	1966	Billy Casper	278
1962	Jack Nicklaus	283	1967	Jack Nicklaus	275
1963	Julius Borros	293			
1964	Ken Venturi	278			

The U.S. Open winning scores for the years 1960 through 1967 given above are for 72 holes played.

1. Which of the players averaged more than 4 strokes per hole? _____ Which of the players averaged less than 4 strokes per hole? _____

	Average	
	More than 4	Less than 4
Arnold Palmer	_____	_____
Gene Littler	_____	_____
Jack Nicklaus	_____	_____
Julius Borros	_____	_____
Ken Venturi	_____	_____
Gary Player	_____	_____
Billy Casper	_____	_____
Jack Nicklaus	_____	_____

2. What was the average winning score for these eight years?

_____

- -

U.S. WOMEN'S OPEN

1960	Betsy Rawls	291	1965	Carol Mann	290
1961	Mickey Wright	293	1966	Gloria Ehret	282
1962	Mrs. Murle Lindstrom	301	1967	Catherine Lacoste	294
1963	Mary Mills	289			
1964	Mickey Wright	290			

The U.S. Women's Open winning scores given above are for 72 holes played.

1. What was the average winning score for these eight years?

_____

2. What was each player's average score per hole?

	Average		
Betsy Rawls	_____	Carol Mann	_____
Mickey Wright	_____	Gloria Ehret	_____
Murle Lindstrom	_____	Catherine Lacoste	_____
Mary Mills	_____		
Mickey Wright	_____		

3. What was the difference between the lowest and highest score for women given? _____

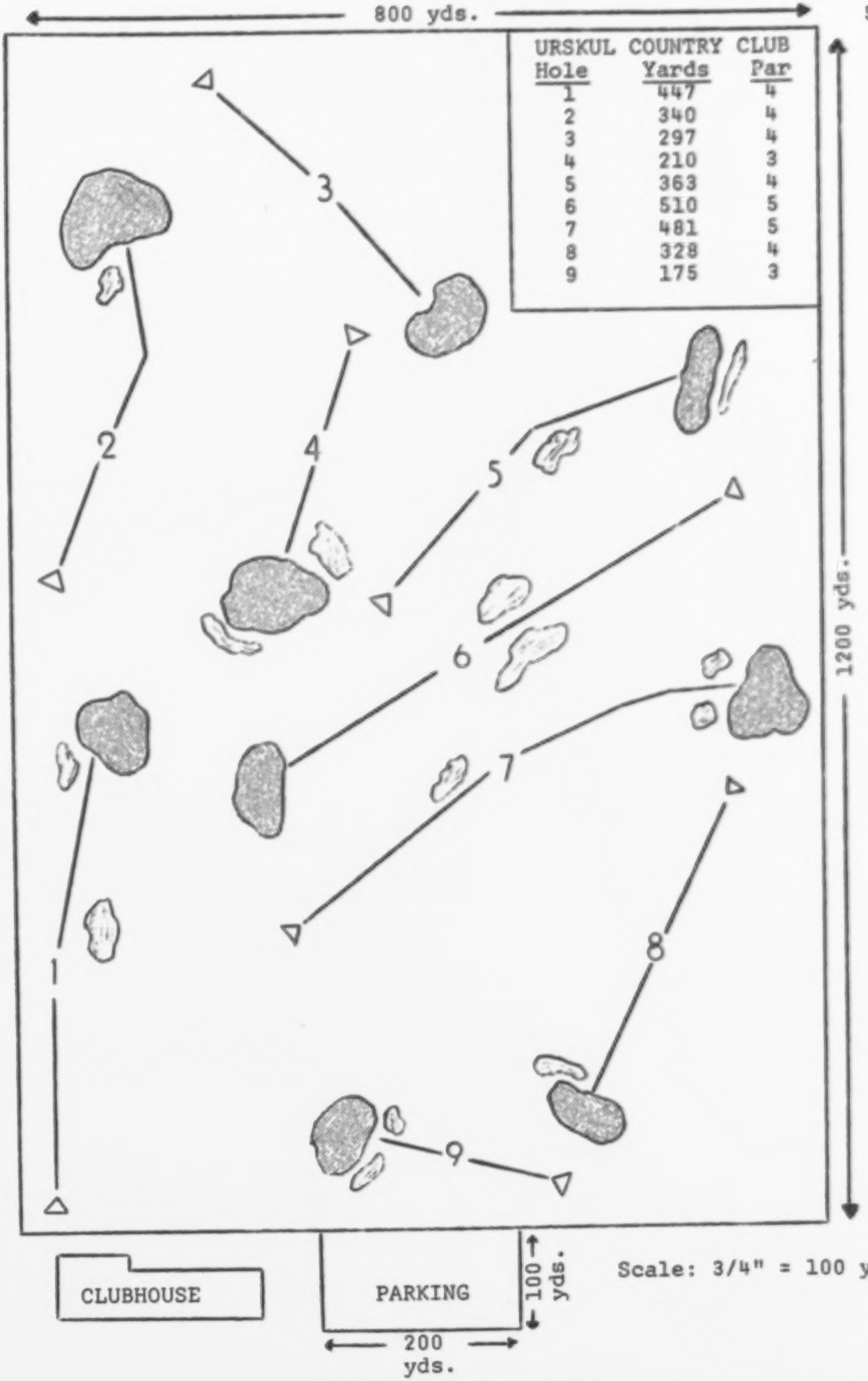
4. Patty Berg, one of the great favorites of women golfers, once played an 18 hole round of 64 in competition, a record not yet matched. What was her average per hole? _____

5. Had Miss Berg played the above match on the Urskul Course, how much above or below par would her score have been?

_____

6. How much lower was the average winning score for the men's open than for the women's open?

_____


N
800 yds.
1200 yds.
URSKUL COUNTRY CLUB
Hole Yards Par
1 447 4
2 340 4
3 297 4
4 210 3
5 363 4
6 510 5
7 481 5
8 328 4
9 175 3
1
2
3
4
5
6
7
8
9
CLUBHOUSE
PARKING
100 yds.
200 yds.
Scale: 3/4" = 100 yds.

1. On the Urskul Golf Course, drawn on the preceding page, hole 5 doglegs to the right. What is the measurement of this angle in degrees? _____

2. If a line from the 15th tee was extended to the north, toward the 4th tee, at what angle would they meet? _____

3. What is the perimeter of this golf course? _____

4. If fencing cost 65¢ per yard, what would be the total cost of fencing the course? _____

5. What is the area of the course in square yards? _____

6. What is the area of the parking lot? _____

7. If it costs 30¢ per square yard to surface the parking lot, what would be the total cost of surfacing it? _____

8. If the parking lot is located at equidistant from each side of the course, how far is it from the N.E. corner of the parking lot to the S.E. corner of the course? _____

9. If a player walked diagonally across the course from the S.W. corner of the course to the N.E. corner of the course, about how many yards would he walk?
   _____ about 1200 yds.
   _____ less than 1500 yds.(>1200 yds
   _____ more than 1900 yds.

- -

1. In 1963 there were 6,250,000 golfers in the U.S. that played 15 or more rounds of golf per year. It is estimated that by 1970 there will be 12,000,000 golfers playing 15 or more rounds per year. What would be the total increase in golfers over this 7 year period?
   _____

2. Assuming they average 25 rounds per year and the cost per round was $2.00, what would be the total cost for all golfers in the U.S. for 1963? _____ for 1970? _____

3. In 1947 there were 4,870 golf courses in the U.S., in 1963 7,500, and it is estimated there will be 11,000 by 1970. What is the total increase from 1947 to 1970? _____ from 1963 to 1970? _____

4. What was the average number of golfers per course in 1963? _____ in 1970? _____

5. In 1960, 36,000 high schools had golf teams. In 1963, there were 78,000 high schools which had teams. What was the increase during this period? _____

6. What per cent of increase was this? _____

TENNIS

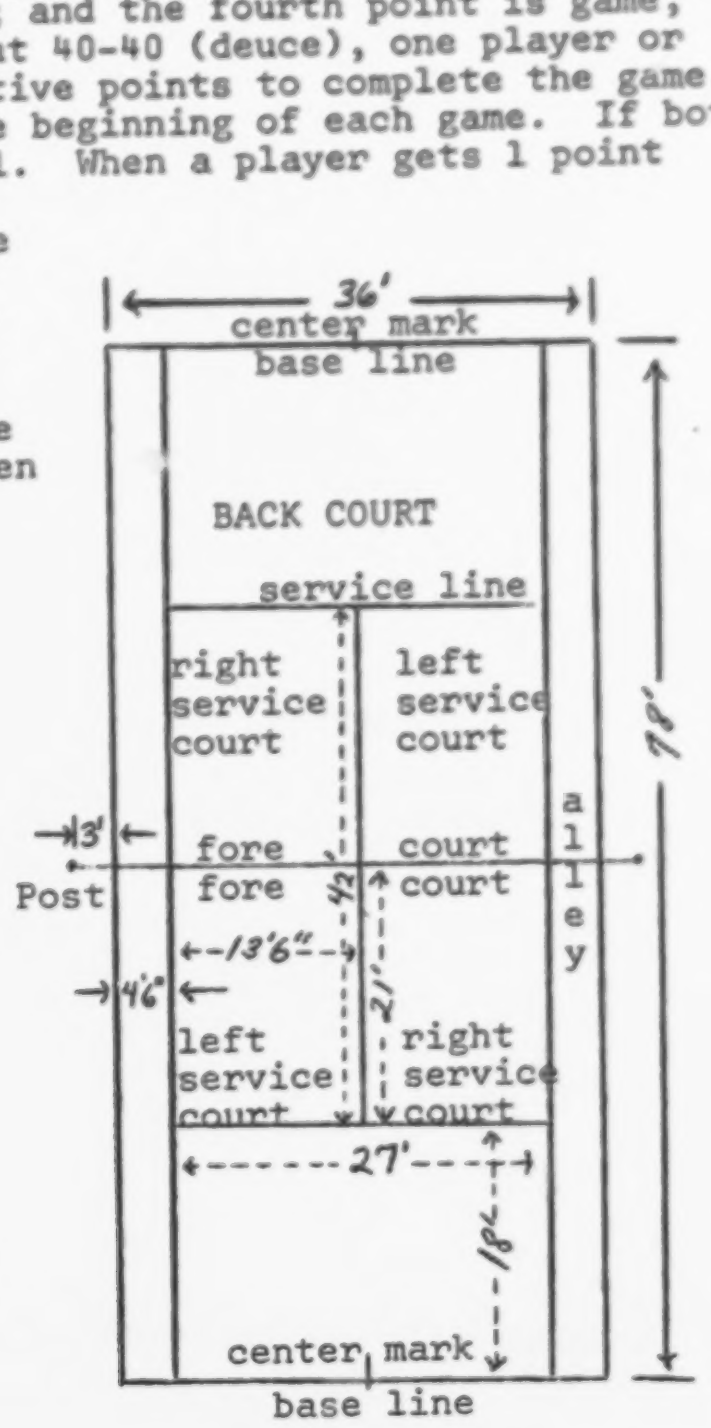
The section on tennis is concerned with counting techniques, drill in following a flow chart, and metric geometry.

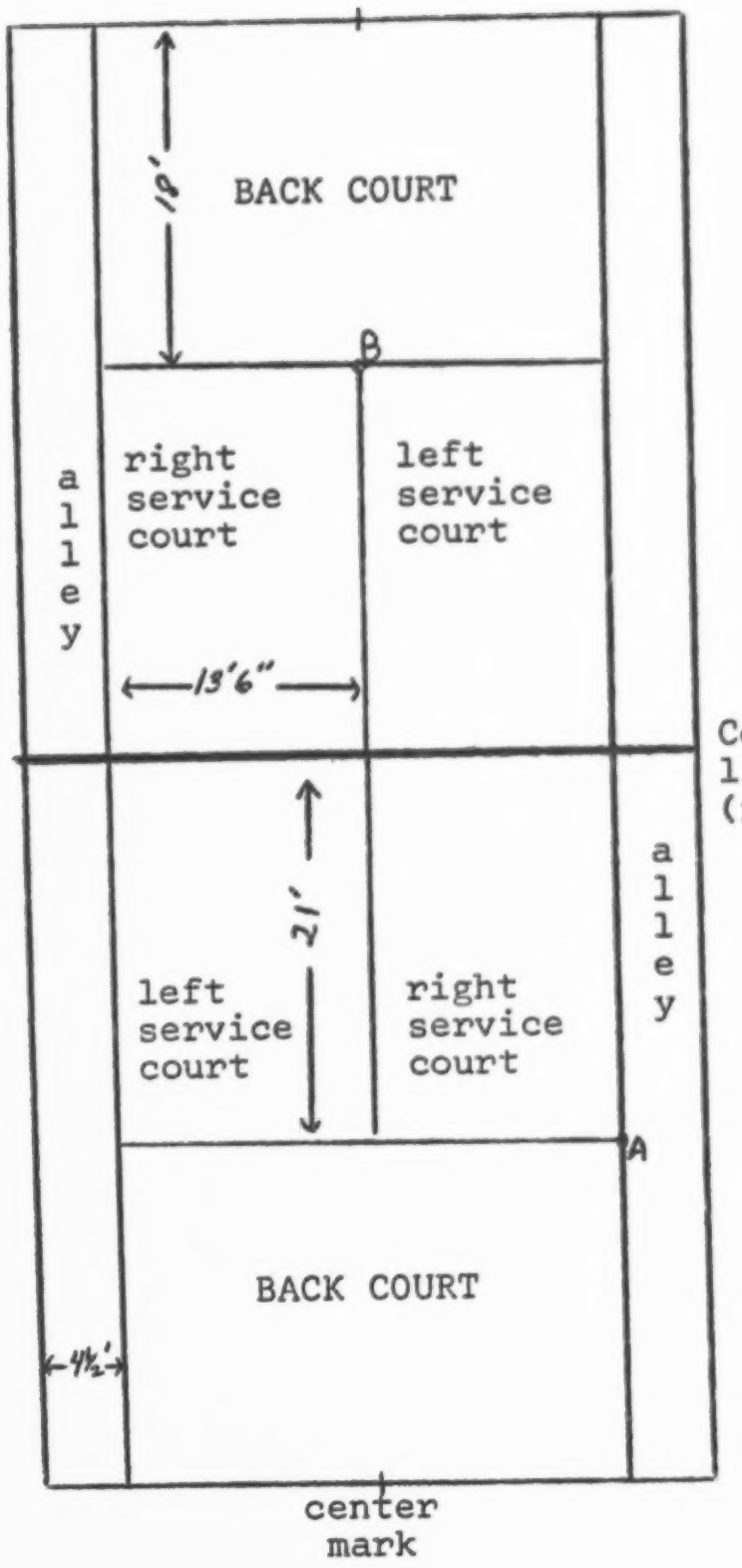
TENNIS

BASIC RULES: The court is 78 feet long and 27 feet wide for singles play and the same length but 36 feet wide for doubles. The net is 3 feet high in the center and 3 1/2 feet high at the net posts. The net posts are located 3 feet outside the sidelines. For doubles a 4 1/2 foot alley is added on either side of the singles court.

The game is played with a racquet and a ball about 2 1/2 inches in diameter. The length of the racquet is about 27 inches. The strung striking surface (head) is oval, about 11 inches long and 9 inches wide, including the frame. The weight of the racquet for adults varies from about 12 to 14 ounces.

A game goes to the first player to win 4 points unless deuce (3 points each) is reached. A set goes to the player winning 6 games except for a deuce provision. A match is for 2 of 3 or 3 of 5 sets. Scoring is as follows: the first point won by a player is called 15; the second, 30; the third, 40; and the fourth point is game, except that if the score is tied at 40-40 (deuce), one player or one team needs to win two consecutive points to complete the game. Each player has 0 or "love" at the beginning of each game. If both players get 2 points, it is 30-all. When a player gets 1 point after 40-all, or deuce, the score is called "Advantage." "Advantage in" means the point is won by the server; "advantage out" means the server has lost the point. After advantage in, if the opponent catches up by winning a point, the score returns again to deuce. When calling the score, call the server's score first.





The tennis court is divided into congruent parts by the center line and the center mark.

All sections of the court are rectangles.

Find the length, width, perimeter, and area of:

the FULL COURT - L _____
W _____
P _____
A _____

the BACK COURT - L 18 feet
W _____
P _____
A _____

the RIGHT SERVICE COURT- L _____
W _____
P _____
A _____

the ALLEY - L _____
W 4 1/2 ft.
P _____
A _____

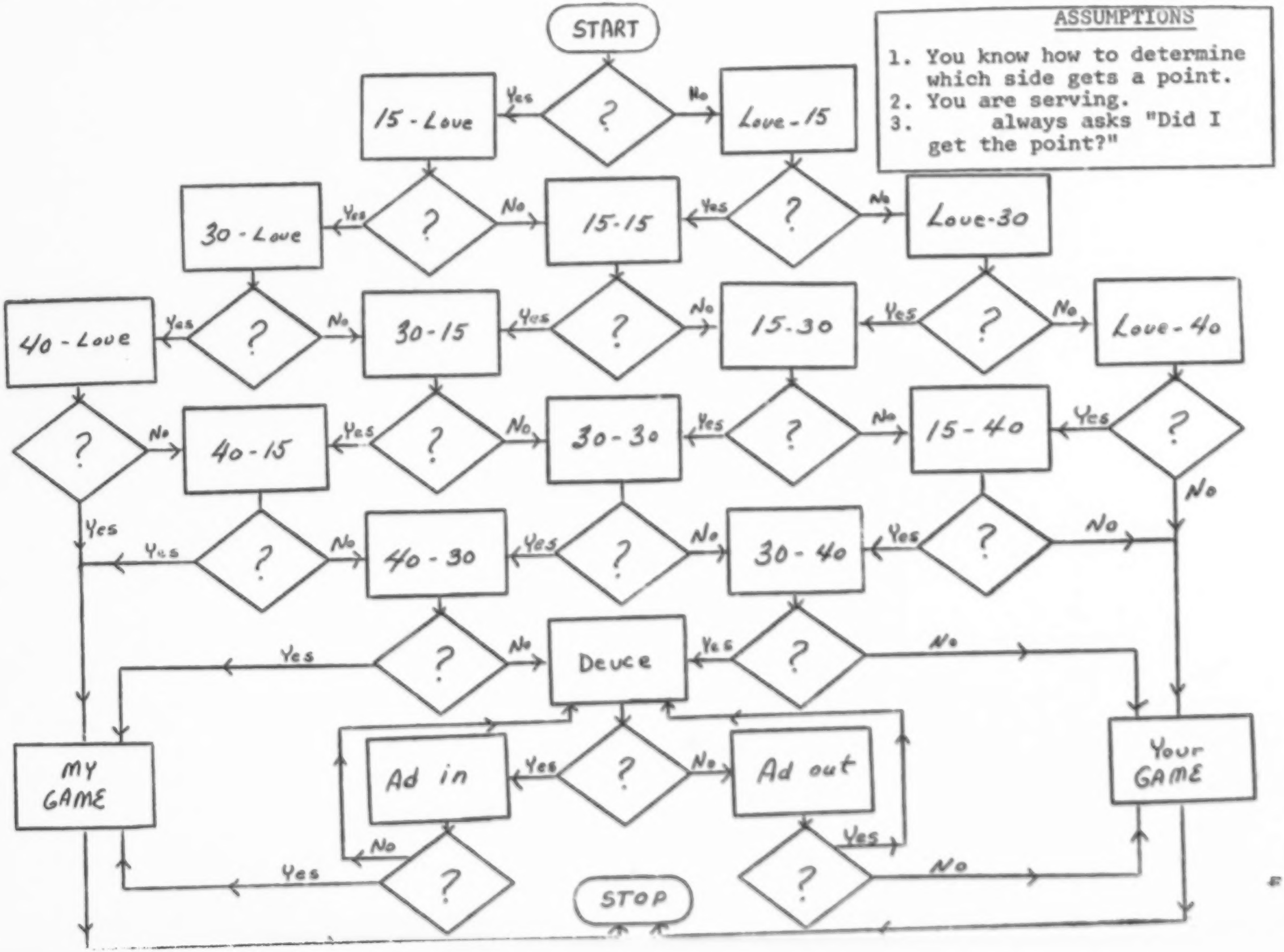
Estimate the number of feet each inch represents in the scale drawing. _____

Point A is about _____ feet from point B.

FLOW CHARTING PROBLEMS ON SCORING TENNIS

A game of tennis is scored 15 for the first point, 30 after two points, 40 after three points and then game after the next point. No points is called "love." You must win by 2 points. A game tied with each person having four points is called deuce. If the person serving has one point more than deuce the score is said to be "ad in." If his opponent has one more point than deuce the score is said to be "ad out." If the game is at "ad in" and the person serving does not get the point, the game returns to deuce.

1. Make a flow chart of the possible ways the scores on a tennis game could go. (See next sheet for a possible flow chart.)
2. How many different ways could you arrive at a score of 15-love?
3. How many different ways could you arrive at a score of 15-15?
4. How many ways could you arrive at a score of 30-15?
5. How many different ways could you arrive at a score of 30-30?
6. How many different ways could you arrive at a score of "deuce" without having been at "ad in" or at "ad out?"
7. Use the flowchart to help you score a hypothetical game. Flip a coin each time you reach a question in the flow chart (i.e., heads--yes, tails--no). Keep score and continue the flipping procedure until you either "win" or "lose" the match.


START
?
15 - Love
Love - 15
30 - Love
15-15
Love-30
40 - Love
30-15
15-30
Love-40
40-15
30-30
15-40
40-30
30-40
Deuce
MY GAME
Ad in
Ad out
Your GAME
STOP
Yes
No
ASSUMPTIONS
1. You know how to determine which side gets a point.
2. You are serving.
3. always asks "Did I get the point?"

T
R
A
C
K

The track section includes conversion of units of measure, the rate, time, and distance relationship, and averaging.

A possible research exercise to be used while the Olympics are in progress is to have a student (or students) find and report on the Decathlon event, its component events, scoring, and records. The method of scoring could provide a good exercise in averaging. Track buffs in class might suggest a scoring scheme for a high school decathlon event based on state or conference high school records.

TRACK

1. An outdoor track in the U.S. measures 440 yards one foot in from the inner circumference.

   440 yd. = _____ ft.
   440 yd. = _____ in.

2. Indoor tracks seldom measure more than 220 yards.

   220 yd. = _____ ft.
   220 yd. = _____ in.

3. In a relay race, four runners run equal distances for a total of one mile.

   1 mile = _____ ft.

   What part of a mile did each runner run? _____
   How many feet did each run? _____
   How many yards did each run? _____

4. Until 1961 nine sprinters shared the world record for the 100 yard dash in 9.3 seconds. How many yards per second did they run?

   _____

5. Bob Hayes lowered the record to 9.1 seconds in 1963. How many yards per second did he run? _____

6. In a two mile relay race there were four runners. What part of a mile did each run (if each ran an equal distance)? _____
   How many feet did each run? _____
   How many yards did each run? _____

7. An athlete at the Drake Relays threw the discus the following distances. Find the average distance. 165 ft., 172 ft., 191 ft., 167 ft., and 170 ft.

   _____

8. Change the following meter runs to feet.

   100 meters ≈ _____ ft.
   200 meters ≈ _____ ft.
   400 meters ≈ _____ ft.
   800 meters ≈ _____ ft.
   1500 meters ≈ _____ ft.
   5000 meters ≈ _____ ft.
   10000 meters ≈ _____ ft.

Note: 1 meter = approx. 3.2808 ft.
1 meter = approx. 1.0936 yds.
≈ means "approximately equal to"

9. Compare 100 yard dash in 9.1 second with 100 meter dash in 10 seconds. Which is a better time in feet per second? _____

10. Compare the 880 yard relay record of 1 minute 45 seconds with the 800 meter relay in 1 minute 44 seconds. Which is faster in feet per second? _____

11. If a pole vaulter jumped the following heights, what was his average height that he jumped? 14 1/2 ft., 14 ft. 5 in., 14 1/2 ft., 14 ft. 7 in., and 14 ft. 8 in.
_____

REFERENCES

NCAA Official Guides--Publications Schedule.
Write to: College Athletics Publishing Service
349 East Thomas Road
Phoenix, Arizona 58012

Menke, Frank G., The Encyclopedia of Sports, Third Revised Edition, A. S. Barnes and Co., New York.

The New York Times Official Sports Record Book, 1968.

MATH IN SPORTS

ANSWER KEY

B A S E B A L L

PAGE

1

Detroit	.744
Cleveland	.700
Chicago	.550
Minnesota	.500
New York	.487
Baltimore	.474
Washington	.456
Oakland	.436
Boston	.385
California	.250

2

Hawks	.594
Cougars	.586
Tigers	.563
Lions	.500
Bears	.469
Wild Cats	.375

3

American League Standings

Detroit	.629
Cleveland	.535
Baltimore	.515 (.5151)
Minnesota	.515 (.5147)
Oakland	.507
Boston	.500
California	.493
New York	.463
Chicago	.448
Washington	.385

National League Standings

St. Louis	.629
San Francisco	.535
Atlanta	.522
Philadelphia	.508
Los Angeles	.500
New York	.493
Cincinnati	.485
Pittsburgh	.470
Chicago	.456
Houston	.397

PAGE

4 Batting averages

	.450
	.440
	.250
	.167
	.320
	.355

2 hits
7 hits
31
3

5

1. F
2. T
3. T
4. T
5. T
6. T
7. F
8. T
9. T
10. T

6

1. a) 4,500,000
   b) 1,250,000
2. a) $112,500
   b) $104,000
   c) $ 8,500
3. 2.976
4. 48,510,000 holes
5. $4,000

7

1. .727
2. 21 games won and 10 games lost
3. .462
4. 34.2%
5. .347
6. .333
7. .357
8. 188 hits

8

9. 30.4%
10. 20 hits
11. .406
12. .500

9

Don Drysdale	.448
Joel Horlen	.731
Luis Tiant	.571
Ferguson Jenkins	.606

Luis Tiant pitched in 12 games which didn't count for or against him.
Average pitching percentage = .587
Joel Horlen had the best pitching percentage.

PAGE

10

St. Louis	.627
San Francisco	.562
Chicago	.540
Cincinnati	.537
Philadelphia	.506
Pittsburgh	.500
Atlanta	.475
Los Angeles	.451
Houston	.432
New York	.377

11

4. Distance between bases-actual 90 feet
scale 9 inches

Distance between home and 2nd base-
actual 127 feet 3 3/8 inches
scale ≈12.73 inches

Distance between 1st base and 3rd base-
actual 127 feet 3 3/8 inches
scale ≈12.73 inches

Distance between pitching rubber and home plate-
actual 60 1/2 feet
scale 6 1/2 inches

12 (See page 9.)

B A S K E T B A L L

2

1. b	6. a
2. b	7. c
3. c	8. a
4. a	9. c
5. c	10. b

4

	f.g. attempted	f.g. made	f.g. per cent	f.t. attempted	f.t. made	f.t. per cent	total points	average	rebounds	bad passes	violations	interceptions	assists	jump balls	fouls
Carol			42.6			74.5	697	26.8							
Judy			40.3			75.0	318	12.2							
Vicki			44.1			65.6	437	16.8							
Margaret			31.0			53.8	33	1.7							
Connie			14.3			41.7	13	.93							
Ilene						0.0	0	0.0							
Joan						0.0	0	0.0							
...															
L-S Total	1423	591	41.5	454	316	69.6	1498	57.6	670	198	147	253	416	344	291

PAGE

9 Only 26 games were played by the team. The column headed "games played" indicates the number of games <u>each</u> player participated in, NOT the total number of games.

Greatest per cent of free throws: Judy (75.0%)
Greatest per cent of field goals: Vicki (44.1%)

	per cent of field goals missed	per cent of free throws missed
Carol	57.4%	25.5%
Vicki	55.9%	34.4%
Margaret	69.0%	46.2%
Connie	85.7%	58.3%

10 1. individual
2. 25%
3. a) 50% b) 33 1/3% or 33.3% c) 40%

11

	tried	per cent	
		made	missed
Sandy	120	40%	60%
Diane	125	60%	40%
Joan	106	50%	50%
Joyce	90	66 2/3%	33 1/3%
Carol	100	75%	25%

Carol.
Not all of the girls shot the same number of times.
100% - 100% of anything is all of that thing.

a) 37 1/2 e) 60
b) 66 2/3 f) 25
c) 60% g) 25
d) 25

12 10 ft. 6 1/4 in.
9 ft. 7 in.
10 ft. 2 1/2 in.
9 ft. 2 in.

11 ft. 4 in.
12 ft. 1 1/4 in.

B O W L I N G
4

	1	2	3	4	5	6	7	8	9	10	TOTAL
Tom	24	44	54	62	71	75	82	102	120	129	129
Nancy	9	16	24	33	33	41	50	59	73	80	80
Chuck	20	36	42	61	70	83	89	98	107	121	121
Karen	20	44	64	77	84	92	110	119	135	141	141
You	30	54	74	92	101	131	156	173	180	200	200

PAGE

5

1. 1990
2. 29%
3. 1360 pounds
4. 73 years
5. 4.3 inches
6. 232.23 square inches ($4 \pi r^2$; $\pi = 3.14$)
7. 26 2/3 revolutions
8. 78 feet
9. 273 square feet
10. 163 feet
11. 32.2%
12. individual
13. individual
14. $2.55
15. $3.30
16. individual

F O O T B A L L

3

1. 3/4" = 10 yds. or 1" = 13 1/3 yds. = 40 feet.
   * The goal posts are placed directly above the goal line for a professional game. The conversion line is the 3 yard line for college games.
2. a) 34 yards = 102 feet
   b) approximately 34 1/2 feet
   c) 24 yards = 72 feet
      approximately 24 1/4 feet
3. individual
4. 34 yard line

4

5. 17 yard line
6. .556
7. 39 yards
8. 7 yards
9.
10. 5333 1/3 square yards
11. 12 ways

touchdown	field goal	safety	P.A.T.
3	0	0	0
2	2	0	0
2	1	1	1
2	0	3	0
2	0	2	2
1	4	0	0
1	3	1	1
1	2	3	0
0	6	0	0
0	4	3	0
0	2	6	0
0	0	9	0

G O L F

PAGE

1

1. 3151 yards
2.

Hole	Par	Bogie	Birdie
1	223 1/2	149	447
2	170	113 1/3	340
3	148 1/2	99	297
4	210	105	impossible
5	181 1/2	121	363
6	170	127 1/2	255
7	160 1/3	120 1/4	240 1/2
8	164	109 1/3	328
9	175	87 1/2	impossible

3. 36

2

1. $914,460.00
2. $114,430.75
3. Palmer (1960) $39,167.75 below
   Player (1961) 89,058.75 below
   Palmer (1962) 32,981.75 below
   Palmer (1963) 13,799.25 above
   Nicklaus (1964) 1,146.75 below
   Nicklaus (1965) 26,321.25 above
   Casper (1966) 7,513.25 above
   Nicklaus (1967) 74,567.25 above
4. Palmer (1960) $18,815.75
   Player (1961) 16,135.00
   Palmer (1962) 20,362.25
   Palmer (1963) 32,057.50
   Nicklaus (1964) 28,321.00
   Nicklaus (1965) 35,188.00
   Casper (1966) 30,486.00
   Nicklaus (1967) 47,249.50
   Total: $228,615.00
5. Palmer (1960) $25,087.67
   Player (1961) 21,513.33
   Palmer (1962) 27,149.67
   Palmer (1963) 42,743.33
   Nicklaus (1964) 37,761.33
   Nicklaus (1965) 46,917.33
   Casper (1966) 40,648.00
   Nicklaus (1967) 62,999.33
   Total: $304,819.99

3

1. More than four strokes - Julius Boros (4.07)
   Less than four strokes - Arnold Palmer (3.89)
   Gene Littler (3.90)
   Jack Nicklaus (3.93-1962)
   (3.82-1967)
   Ken Venturi (3.86)
   Gary Player (3.92)
   Billy Casper (3.86)
2. 281 1/4 or 281.25

PAGE

3 (continued)

1. 291 1/4 or 291.25
2. Betsy Rawls 4.06
   Mickey Wright (1961) 4.07
   Murle Lindstrom 4.18
   Mary Mills 4.01
   Mickey Wright (1964) 4.03
   Carol Mann 4.03
   Gloria Ehret 3.92
   Catherine Lacoste 4.08

4

3. 19
4. 3.56
5. 8 strokes under par
6. 10 strokes

6

1. 151°
2. 27°
3. 4000 yards
4. $2,600.00
5. 960,000 square yards
6. 20,000 square yards
7. $6,000.00
8. 300 yards
9. less than 1500 yds. but more than 1200 yards

1. 5,750,000
2. $312,500,000 $600,000,000
3. 6,130 3500
4. 833 1/3 1090 $\frac{10}{11}$
5. 42,000
6. 116 2/5%

T E N N I S

2

Full Court - length - 78 feet
width - 36 feet
perimeter - 228 feet
area - 2808 square feet

Back Court - length - 18 feet
width - 27 feet
perimeter - 90 feet
area - 486 square feet

Right Service Court -
length - 21 feet
width - 13 1/2 feet
perimeter - 69 feet
area - 283 1/2 square feet

Alley - length - 78 feet
width - 4 1/2 feet
perimeter - 165 feet
area - 351 square feet

1 inch = 12 feet
Point A is about 43 1/2 feet from point B.

PAGE 3

1. individual
2. 1
3. 2
4. 3
5. 6
6. 12
7. individual

TRACK 1

1. 1320 feet 15,840 inches
2. 660 feet 7,920 inches
3. 5280 feet 1/4 mile 1320 feet 440 yards
4. 10.753 yards/second
5. 10.989 yards/second
6. 1/2 mile 2640 feet 880 yards
7. 173 feet
8. 100 meters≈ 328 feet
   200 meters≈ 656 feet
   400 meters≈ 1312 feet
   800 meters≈ 2624 feet
   1500 meters≈ 5920 feet
   5000 meters≈16400 feet
   10000 meters≈32800 feet

2

9. 100 yard dash

100 yd. dash ≈32.967 ft./sec.
100 meter dash ≈32.808 ft./sec.

10. 800 meter relay

800 yd. relay ≈25.143 ft./sec.
800 meter relay≈25.237 ft./sec.

11. 14 feet 6.4 inches or
    14 feet 6 2/5 inches

Addition to B A S E B A L L

PAGE 12

1. Crosley Field
2. Atlanta Stadium
   Memorial Stadium
   Anaheim Stadium
   White Sox Park
   Municipal Stadium
   Astrodome
   Dodger Stadium
   Shea Stadium
   Oakland-Alameda County Coliseum
   Candlestick Park
   Busch Memorial Stadium
   D.C. Stadium
3. Crosley Field (least distance)
   Yankee Stadium (greatest distance)
4.

National league			American League		
left field	center field	right field	left field	center field	right field
338.8	414.3	335.4	238.1	420.5	323.2

Both Leagues		
left field	center field	right field
333.45	417.4	329.3

*5. a) 1019 feet
    b) 1154 feet
    c) 1202 feet
    d) 1127 feet
    e) 1164 feet